

<p align="center">13 GAS CHROMATOGRAPHY</p>	<p align="center">Page 1 of 3</p>
<p align="center">Division of Forensic Science</p> <p align="center">TRACE EVIDENCE TRAINING MANUAL</p>	<p align="center">Amendment Designator:</p>
	<p align="center">Effective Date: 29-March-2004</p>
<p align="center">13 GAS CHROMATOGRAPHY (GC)</p> <p>13.1 Introduction to Gas Chromatography</p> <p>13.1.1 Objectives</p> <p>Through completion of this module the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:</p> <ul style="list-style-type: none"> • Describe the basic theory and draw a basic diagram of the major components of the instrument; • Describe the capabilities and limitations of the instrument; • Describe the practical applications of gas chromatography; and, • Define gas chromatography terminology. <p>13.1.2 Required Readings</p> <p>13.1.2.1 Braithwaite, A., and Smith, F.J., <u>Chromatographic Methods</u>, 4th ed., Chapman and Hall, Ltd., New York, NY, 1985, Chapters 1, 2 & 5.</p> <p>13.1.2.2 Freeman, R. R., ed., et.al., <u>High Resolution Gas Chromatography</u>, 2nd edition, Hewlett Packard Co., 1989</p> <p>13.1.2.3 Willard, H. H., Merritt, L.L., and Dean, J.A., <u>Instrumental Methods of Analysis</u>, 5th edition, Van Nostrand, New York, NY, 1974, Chapter 19.</p> <p>13.1.2.4 Rood, Dean., <u>A Practical Guide to the Care, Maintenance, and Troubleshooting of Capillary Gas Chromatographic Systems</u>, 3rd edition, Wiley-VCH, Federal Republic of Germany, 1999.</p> <p>13.1.3 Questions</p> <p>The trainee will provide written answers to the following questions:</p> <ul style="list-style-type: none"> • Describe a gas chromatograph using layman's terms. • Draw a basic gas chromatograph and label the major components. Describe the purpose of each component. • Define the following terms: <ul style="list-style-type: none"> ○ Distribution coefficient ○ Capacity factor ○ Phase ratio ○ Selectivity ○ Separation efficiency ○ Resolution ○ Retention time ○ Theoretical plates and HETP ○ VanDeemter and Golay equations ○ Linear velocity and eddy diffusion • Define carrier gas, describe various types and what parameters are used in selecting the proper carrier gas. • Describe the inlet system. • Describe septum bleed and purge. • Describe and draw split and splitless injection. • Describe solvent effects. • Compare capillary columns versus packed columns. 	

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<div> <ul style="list-style-type: none"> • Define stationary phase and list examples of different types of stationary phases. • Define cross-linking. • Explain column overload and its effects. • Compare/contrast isothermal programming versus temperature programming and their application in the Trace Evidence laboratory. • Give a general description of the different types of detectors. Give detailed information regarding the ECD and the FID. Include sensitivity, make-up gas and function in the description of each detector. </div> <div> <p>13.1.4 Evaluation</p> <p>13.1.4.1 The trainer will review the written answers to the questions with the trainee.</p> <p>13.1.4.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.</p> <p>13.1.4.3 The trainee will be quizzed orally upon the subject matter.</p> </div> <div> <p>13.2 Sample Preparation and Data Collection</p> <p>13.2.1 Objectives</p> <p>Through completion of this module the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:</p> <ul style="list-style-type: none"> • Prepare and inject samples to include gases, liquids and solids; and, • Discuss and perform the quality assurance/quality control requirements for the Trace Evidence gas chromatographs. <p>13.2.2 Required Readings</p> <p>13.2.2.1 Trace Evidence Section Standard Operating Procedures for gas chromatography.</p> <p>13.2.3 Questions</p> <p>The trainee will provide written answers to the following questions:</p> <ul style="list-style-type: none"> • Describe the daily and monthly QC checks for all of the gas chromatographs. Include discussion as to why each check is performed. <p>13.2.4 Practical Exercises</p> <p>13.2.4.1 The trainer will demonstrate the daily and monthly QC procedures for the gas chromatographs.</p> <p>13.2.4.2 The trainee will perform the daily QC procedures for the gas chromatographs for a minimum of one week.</p> <p>13.2.4.3 The trainee will perform the monthly QC procedures for the gas chromatographs for a minimum of four months.</p> <p>13.2.4.4 The trainer will demonstrate headspace injections.</p> <p>13.2.5 Evaluation</p> <p>13.2.5.1 The trainer will review the written answers to the questions with the trainee.</p> </div>	

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<p>13.2.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.</p> <p>13.2.5.3 Review of practical exercises.</p> <p>13.3 Competency Evaluation and Mock Trial</p> <p>The trainee will use gas chromatography when completing their subdiscipline competency test and will defend their results as a part of their mock trial in that subdiscipline.</p> <p>13.4 Reading List</p> <p>13.4.1 Braithwaite, A., and Smith, F.J., <u>Chromatographic Methods</u>, 4th ed., Chapman and Hall, Ltd., New York, NY, 1985.</p> <p>13.4.2 Freeman, R. R., ed., et.al., <u>High Resolution Gas Chromatography</u>, 2nd edition, Hewlett Packard Co., 1989.</p> <p>13.4.3 Rood, Dean., <u>A Practical Guide to the Care, Maintenance, and Troubleshooting of Capillary Gas Chromatographic Systems</u>, 3rd edition, Wiley-VCH, Federal Republic of Germany, 1999.</p> <p>13.4.4 Trace Evidence Section Standard Operating Procedures for gas chromatography.</p> <p>13.4.5 Willard, H. H., Merritt, L.L., and Dean, J.A., <u>Instrumental Methods of Analysis</u>, 5th edition, Van Nostrand, New York, NY, 1974.</p> <p align="right">◀End</p>	